ELECTRIC FIELD & CAPACITOR
MODEL SOLUTION

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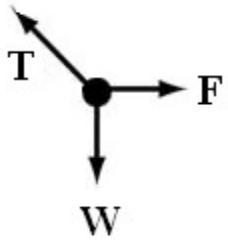
3. Charge, Q = CV
= 20μ X 6000
= **0.12 C**

Energy, E = ½ CV^2
= ½ X 20μ X 6000^2
= 360 J

Resistance, R = V / I
= 6000 / 40
= 150 Ω

Time, t = Q / I
= 0.12 / 40
= 3.0×10^{-3} s

In practice the time for discharge is longer than this calculated time because the rate of discharge decreases with time.



At equilibrium,
Vertically, **W = T cos θ**
Horizontally, **F = T sin θ**
F / W = tan θ
Therefore **F = W tan θ**

$F = kQq / r^2$
Fr^2 = constant

For r = 36×10^{-3} m

$F [36 \times 10^{-3}]^2 = [142 \times 10^{-3}][18 \times 10^{-3}]^2$
$F = [18/36]^2 [142 \times 10^{-3}]$

$= \underline{35.5 \times 10^{-3}\ N}$

For $r = 27 \times 10^{-3}$ m

$$F[27 \times 10^{-3}]^2 = [142 \times 10^{-3}][18 \times 10^{-3}]^2$$
$$F = [18/27]^2\,[142 \times 10^{-3}]$$
$$= \underline{63.1 \times 10^{-3}\ N}$$

It was necessary for the student to take measurements quickly using this arrangement because of the discharging of charge.

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